

REMARKS

Claims 2-8, 15, 16 and 18-27 are pending in the present application. Claims 4-6, 19-22 and 24-26 have been withdrawn from consideration as being non-elected claims.

Claim Rejections-35 U.S.C. 103

Claims 2, 3, 7, 8, 15, 16, 18, 23 and 27 have been rejected under 35 U.S.C. 103(a) as being unpatentable over the Aoki et al. reference (U.S. Patent No. 6,033,953) in view of the Lu reference (U.S. Patent No. 5,679,596). This rejection is respectfully traversed for the following reasons.

The ferroelectric capacitor of claim 2 includes in combination among other features a ferroelectric layer "formed on the bottom electrode and the projection electrodes...wherein a thickness of the ferroelectric layer on the projection electrodes is less than a thickness of the ferroelectric layer on the bottom electrode, and wherein spacing between central portions of each projection electrode has a range from 10% to 20% of a size of the ferroelectric capacitor". Applicant respectfully submits that claim 2 would not have been obvious in view of the prior art as relied upon for at least the following reasons.

The Examiner has interpreted bottom electrode 38 and pointed convex parts 38a as shown in Fig. 14 of the Aoki et al. reference respectively as the bottom electrode and the plurality of projection electrodes of claim 2. The Examiner has acknowledged that the Aoki et al. reference fails to teach spacing between central portions of each

projection electrode having a range from 10% to 20% of a size of the ferroelectric capacitor.

In an effort to overcome this acknowledged deficiency of the Aoki et al. reference, the Examiner has relied upon Fig. 5 of the Lu reference and has asserted that the spacing between polysilicon pillars 14b inherently meets the above noted features of claim 2. The Examiner has alleged that it would have been obvious to provide spacing between central portions of each of pointed convex parts 38a of the Aoki et al. reference as featured in claim 2, in view of the Lu reference. Applicant respectfully disagrees for the following reasons.

As described beginning in column 1, line 46 of the Aoki et al. reference with respect to Figs. 6 and 14, the bottom electrode of the capacitor is formed by sputtering or vapor depositing platinum. However, the surface of platinum bottom electrode 38 manifests a rough surface with many pointed convex parts 38a existing in an island shape as shown in Fig. 14. This is due to the fact that particles of platinum adhere in a conical shape during sputtering or vapor deposition. As a result of the pointed convex parts 38a which occur in platinum bottom electrode 38, leakage current is great and becomes a major defect influencing performance of the dielectric memory device. As described further beginning in column 2, line 41 of the Aoki et al. reference, in a preferred embodiment the pointed ends of the convex parts existing on the surface of the platinum electrode are very finely polished in a uniform manner to be flattened, by being dissolved in an electrolytic solution. As a result, electric field convergence is

avoided during operation and leakage current decreases considerably.

Applicant respectfully submits that the pointed convex parts 38a of bottom electrode 38 as described with respect to Figs. 6 and 14 of the Aoki et al. reference are incidentally and unintentionally formed on the surface of platinum bottom electrode 38 in random manner. This should be readily clear, because as acknowledged by the Examiner, there is no specific spacing between pointed convex parts 38a.

As noted above, the bottom electrode 38 of the ferroelectric capacitor of the Aoki et al. reference is made of platinum by sputtering or vapor deposition. In contrast, as described generally in columns 1 and 2 of the Lu reference, and more particularly as beginning in column 2, line 9, the preferred embodiment features the use of silicon islands, or spot deposited polysilicon, used as a mask to subsequently produce a bottom electrode comprised of polysilicon pillars, and crevices in the polysilicon.

Applicant respectfully submits that one of ordinary skill would have no motivation to modify a method of forming a platinum capacitor electrode as by sputtering or vapor deposition, in view of a method of forming a polysilicon capacitor electrode having pillars formed by spot deposited polysilicon. That is, different electrode materials and processes are used, and the methods of electrode formation are thus incompatible with each other. It is thus not clear how the convex parts 38a in the Aoki et al. reference could be formed by sputtering or vapor deposition in a controlled manner so as to have specific spacing therebetween as suggested by the Examiner. The Examiner has failed to explain or establish how the convex parts 38a of the Aoki et

al. reference could be formed to have specific spacing therebetween so as to meet the features of claim 2. Applicant therefore respectfully submits that the ferroelectric capacitor of claim 2 would not have been obvious in view of the prior art as relied upon by the Examiner taken singularly or together, and that this rejection of claims 2 and 8 is improper for at least these reasons.

The ferroelectric capacitor of claim 3 includes in combination among other features a bottom electrode; a plurality of projection electrodes formed on the bottom electrode; and a ferroelectric layer formed on the bottom electrode and the projection electrodes, "wherein a thickness of the ferroelectric layer on the projection electrodes is less than a thickness of the ferroelectric layer on the bottom electrode and wherein a size of each projection electrode has a range from 5% to 10% of a size of the ferroelectric capacitor".

The Examiner has relied upon the Aoki et al. reference as previously, and has acknowledged that the Aoki et al. reference fails to teach a size of each projection electrode having a range from 5% to 10% of a size of the ferroelectric capacitor. In an effort to overcome this acknowledged deficiency, the Examiner has relied upon the Lu reference and has asserted that it would have been obvious to provide a size of each pointed convex part 38a in the Aoki et al. reference as having a size in the range as featured. Applicant respectfully disagrees for the following reasons.

As noted above, the platinum capacitor electrode of the Aoki et al. reference includes convex parts 38a which are formed incidentally and unintentionally by

sputtering or vapor deposition. Applicant respectfully submits that one of ordinary skill would have no motivation to modify a method of forming a platinum capacitor electrode as by sputtering or vapor deposition, in view of a method of forming a polysilicon capacitor electrode having pillars as formed by spot deposited polysilicon. Applicant therefore respectfully submits that the ferroelectric capacitor of claim 3 would not have been obvious in view of the prior art as relied upon by the Examiner taken singularly or together, and that this rejection of claims 3 and 23 is improper for at least these reasons.

The ferroelectric capacitor of claim 7 includes in combination among other features that "the projection electrodes are arranged evenly spaced on the bottom electrode". The Examiner has relied upon the Aoki et al. reference and the Lu reference in a somewhat similar manner as previously. Applicant however respectfully submits that one of ordinary skill would have no motivation to modify a method of forming a platinum capacitor electrode as by sputtering or vapor deposition, in view of a method of forming a polysilicon capacitor electrode having pillars as formed by spot deposited polysilicon. That is, it is not clear how the pointed convex parts 38a of the platinum bottom capacitor electrode of the Aoki et al. reference could be formed evenly spaced. The Examiner has not established or explained how the Aoki et al. reference could be modified to meet these features, particularly given the fact that different respective electrode materials and processes are disclosed. Applicant therefore respectfully submits that the ferroelectric capacitor of claim 7 would not have been

obvious in view of the prior art as relied upon by the Examiner taken singularly or together, and that this rejection of claims 7 and 27 is improper for at least these reasons.

The ferroelectric capacitor of claim 15 includes in combination among other features a plurality of third electrodes "formed evenly spaced between the first electrode and the second electrode, wherein the third electrodes generate polarization".

Applicant respectfully submits that one of ordinary skill would have no motivation to modify a method of forming a platinum capacitor electrode as featured by sputtering or vapor deposition, in view of a method of forming a polysilicon capacitor electrode having pillars as formed by spot deposited polysilicon, as would be necessary to meet the features of claim 15. It is not clear how the pointed convex parts 38a of the Aoki et al. reference could be formed as being evenly spaced. Applicant therefore respectfully submits that the ferroelectric capacitor of claim 15 would not have been obvious in view of the prior art as relied upon by the Examiner taken singularly or together, and that this rejection of claims 15, 16 and 18 is improper for at least these reasons.

Conclusion

The Examiner is respectfully requested to reconsider and withdraw the above noted rejection, and to acknowledge that claims 2, 3, 7, 8, 15, 16, 18, 23 and 27 are allowable, for at least the above reasons. The Examiner is also respectfully requested to rejoin claims 4-6, 19-22 and 24-27, which as dependent upon the above noted claims

should be allowable for at least the same reasons as set forth above.

In the event that there are any outstanding matters remaining in the present application, please contact Andrew J. Telesz, Jr. (Reg. No. 33,581) at (571) 283-0720 in the Washington, D.C. area, to discuss these matters.

Pursuant to the provisions of 37 C.F.R. 1.17 and 1.136(a), the Applicant hereby petitions for an extension of one (1) month to January 29, 2007, for the period in which to file a response to the outstanding Office Action. The required fee of \$120.00 should be charged to Deposit Account No. 50-0238.

If necessary, the Commissioner is hereby authorized in this, concurrent, and future replies, to charge payment for any additional fees that may be required, or credit any overpayment, to Deposit Account No. 50-0238.

Respectfully submitted,

VOLENTINE & WHITT, P.L.L.C.

A handwritten signature in black ink, appearing to read 'Andrew J. Telesz, Jr.', with a stylized flourish at the end.

Andrew J. Telesz, Jr.
Registration No. 33,581

11951 Freedom Drive, Suite 1260
Reston, Virginia 20190
Telephone No.: (571) 283-0720
Facsimile No.: (571) 283-0740